

METHOD OF CHEMICAL MODIFICATION OF STRUCTURE TOPOGRAPHY

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ABSTRACT OF THE DISCLOSURE

10 A method is provided for filling high aspect ratio  
gaps without void formation by using a high density  
plasma (HDP) deposition process with a sequence of  
deposition and hydrogen etch steps. The first step  
uses an etch/dep ratio less than one to quickly fill  
the gap. The first step is interrupted before the  
opening to the gap is closed. The second step uses a  
15 hydrogen-based plasma to chemically etch the deposited  
material to widen the gap. The second step is stopped  
before corners of the elements forming the gaps are  
exposed. These steps can be repeated until the aspect  
ratio of the gap is reduced so that void-free gap-fill  
20 is possible. The etch/dep ratio and duration of each  
step can be optimized for high throughput and high  
aspect ratio gap-fill capacity.